

FROM ASP TO WEB SERVICES: IDENTIFYING KEY PERFORMANCE AREAS AND INDICATORS FOR HEALTHCARE

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Abstract

Value creation from e-business for customers in healthcare is an important topic in academic and practitioner circles. This paper reports the findings from a two-year research study, which found that disappointing results from the much hyped application service provider (ASP) business model, is currently being replaced by perceived new opportunities from Web Services. Yet past failings from ASP do not guarantee future success with web services models, particularly as evidence shows that accruing value added benefits from e-business initiatives is often fraught with difficulty. Healthcare is no exception, and is likely to pose more problems given the complexity of the organisational structures, processes, procedures and activities within this vertical sector. This research study calls for a more rigorous approach in identifying and evaluating key performance areas and indicators from new e-business initiatives involving emerging technologies and platforms such as Web services. Yet the measures and metrics used for healthcare may differ from those adopted in other sectors. Healthcare professionals will therefore need to develop context specific KPAs and KPIs, and caution against accepting 'face value' the value proposition devised by Web service providers.

Keywords: E-Commerce in Healthcare Performance Areas/Indicator, Web Services, Evaluation, ASP Demise

1 INTRODUCTION

The process of healthcare management modernization is maturing in Europe, North America and in other developed countries. This has resulted to an exponential increase in demand for rapid business process execution, more accurate and timely information, and additional automated information systems (IS). Interest in Web Services is emerging in many different guises. As sub-set of e-business, Web Services offer customers software-as-a-service. The principle of operation is similar to the application service provision (ASP) model, priced on a pay-as-you-go, utility model of business computing (Currie et al, 2004). Against a background of disappointing results from ASP (Hagel 2002) Web Services are designed to resolve problems of poor integration (interoperability) between software applications and low customer satisfaction. This research treats the Web Services business model as the main unit of analysis and seeks to identify how value is created for customers (Perseid 2003, Sleeper & Robins 2001). Despite the promises of vendors, Web Services have fared poorly in terms of attracting a large client base (CBDI 2003). The reasons for this are both technical and commercial (Hagel 2002). The fallout from the ASP market provides some important lessons for vendors offering software-as-a-service, and for e-business models more generally.

This paper presents the findings from a two-year research that examines both the supply-side and customer-side of deploying, hosting and integrating e-business models, focusing primarily on Web Services in the UK health sector. The paper is structured into three main areas. It begins with a discussion of ASP taxonomies and argues that the various templates for ASP were essentially flawed for a combination of technical or business reasons. Within the healthcare sector, technology vendors failed to develop e-business models that created value for customers. They adopted a technology push strategy where product and services are offered to customers without a clear understanding of their business requirements (Cassidy 2002). This section is followed by an overview of the research study and methods used for data collection and analysis. Next, we present the results from a questionnaire survey and interviews with health care professionals. Using a risk assessment framework, which captures five key performance areas (KPA) for evaluating the software-as-a-service business model (which includes both ASP and Web services) (Currie 2003), this research applies this framework within the healthcare sector. Comparing the results from healthcare with those of five sectors (Currie et al, 2004), we observe that priorities and preferences vary. This suggests that service provider vendors need to identify a more rigorous approach in developing their value propositions from e-business for specific industrial sectors, since a *one-size-fits-all* approach is inappropriate. The paper concludes by offering future directions for research on emerging technologies within healthcare.

2 LESSONS FROM THE FIRST PHASE OF THE ASP MODEL

The emergence of the ASP model suggested an answer to prevailing question: ‘Why should small businesses and non-IT organisations spend substantial resources on continuously upgrading their IT?’ Many believed that application outsourcing, using the ASP model could provide the solution to enhancing IT efficiency and reducing the total cost of ownership of IT (IDC 2000). Within the context of healthcare, ASPs could offer both horizontal (business facing) and vertical (sector-specific) software solutions. An example of the latter could be in the form of electronic patient records (EPR) systems (Guah & Currie 2004). An ASP assumes responsibility for buying, hosting, and maintaining a software application on its own facilities, publishing its user interfaces over the networks, and provides its clients with a shared access to the published interfaces. The customer simply has to subscribe to the service to receive the application over an Internet or dedicated intranet connection, as an alternative to hosting the same application in house (Guah & Currie 2004).

The impetus behind ASP was fuelled by the belief that *utility computing* offered a new business model to customers, similar to electricity, gas and water. The commercialisation of the Internet meant that, as network traffic increased in a firm's data centre, IT architecture would trigger other resources into

action, including idle servers, applications or pools of network storage. The firm would pay only for the amount of time it used the services. Thus, the concept of 'software-as-a-service' was created. Accessing IT resources in this way would result in reduced up-front investment and expenditure, enabling firms to buy services on a variable-price basis (Dewire 2000). This fuelled opportunities in the late 1990s for service providers to offer software applications and IT infrastructure on a rental, pay-as-you-go pricing model (Bennet & Timbrell 2000). An ASP could be a commercial entity, providing a paid service to customers (Susarla, Barua & Whinston 2003) or, conversely, a not-for-profit organisation supporting end users (Currie et al 2004).

In healthcare, an ASP may provide some mix of application services for laboratory, prescribing, charting, outpatient visit, coding, and clinician scheduling, and reporting. Some may even offer clinical alerts normally associated with expensive institution-based EPR systems, including health warnings of potential drug reactions. Through the provision of this one-to-many model over the Internet, an ASP takes patient charts and medical records and keeps them on a centrally managed repository, to which a healthcare provider can gain access from anywhere in the world. This can allow for a physician to review the patient's medication lists from all previous encounters and their prescription-filling habits (provided all the legal requirements of patient confidentiality have been arranged).

2.1 ASP Taxonomies

Taxonomies represent 'ideal type' scenarios, which may not exist in their pure form (Currie et al 2004). They are useful for providing a framework for organizing phenomena by attempting to deconstruct the various components and/or characteristics. Variations exist within *ideal-typical* categories, as well as overlap between categories. During the first wave of the ASP market, many different types of ASP emerged. Some were concerned to offer a broad, *horizontal* product and service portfolio, while others target specific vertical industry sectors, like healthcare. Table 1 focus upon a horizontal ASP products/services portfolio and, Table 2 looks at the service providers targeting the healthcare vertical sector. Each of these categories implies a different outsourcing relationship between supplier and customer.

Type of ASP	Description	Generic Examples	Key Challenges
Mixed/Vertical	Industry-specific (health, finance, transportation)	SchlumbergerSema (health) Bloomberg (Finance) S/W for Excellence (Dental)	Limited customer base Reliant upon major vendors Restricted by sector-based economic
Horizontal	Business software (accounting, human resource, travel)	Salesforce.com (HR) Concur (travel) SAGE (accounting)	Low barriers to entry; Undifferentiated products/services
Enterprise	Complex business software (ERP, CRM, supply and logistics)	SAP Oracle McKesson	Very expensive for small/medium organisations Channel conflicts; Data security/integrity
Pure-Play	Internet/Web-enabled software application (email/security/disaster recovery)	Graphnet Health iSoft Mail.com	Unprofitable commodity applications; Reliant upon VC funding; Unstable/volatile/dynamic market
Infrastructure	Technology partners to ASP (telco, data centre, networking)	Cable and Wireless BT CISCO	Technical inhibitors Over-capacity Severe competition

Table 1. Taxonomy of ASPs based on a horizontal product/service portfolio (Currie et al 2004).

The first ASP taxonomy (see Table 1) delineates ASPs into *vertical* (industry-specific), *horizontal* (across/within business functions); *enterprise* (complex software such as ERP and CRM); *pure-play* (web-enabled applications) and *infrastructure* (data-centre, networking and other supporting technology) (Currie et al 2004). Whilst many research analysts and pundits suggested that vertical ASPs offered excellent opportunities for business development, they also needed to address key challenges, such as, a limited customer base; potential problems in serving only one sector/sub-sector; potential over-reliance on one Internet service vendor (ISV); and others. By restricting their potential customer base, vertical ASPs believed they could offer a high level of service since they marketed themselves as having an in-depth knowledge of the sector/sub-sector they served.

The second taxonomy (see Table 2) of the ASP market adopts five categories: ASP resellers, ASP developers, ASP aggregators, hosting services, and managed services providers (Hagel 2002, p. 45). Comparing the two ASP taxonomies reveals significant similarities with considerable overlap between categories and activities of the various players. The *ideal typical* categories provided by different taxonomies offer an illustration of the market/strategic positioning and product/service portfolios of ASPs, and should not be treated as rigid categories in their own right. Given the confusion which surrounded the first wave of ASPs, attempts to deconstruct the ASP business model and market into taxonomies is a useful exercise, which may provide some clarity to the phenomenon under scrutiny.

ASP taxonomies can be further mapped across the netsourcing stack, which captures a variety of customer/supplier scenarios '*where relationships in this space are very complicated*' (Kern, Lacity & Willcocks 2002, p. 115). For example, an ASP delivering a hosted software application to the end customer, may subcontract data centre services, billing, help desk, and other support services to additional firms. Furthermore, the ASP may not even own or have developed the software, as this may be the intellectual property of an Internet Service Vendor. In the case of enterprise ASPs and ASP resellers, developers, and aggregators, these firms may form complex strategic alliances or partnerships with leading ERP vendors, usually for specific target customer (see Table 2).

As a forerunner to the current Web Services market, ASP was highly volatile, dynamic and immature market. A recent review of the ASP industry (Susarla et al 2003) concluded that the technological factors like scalability; speed and focus, and the behavioural aspects of price and flexibility were the key drivers of the model. The inhibitors of the model were poor connectivity, lack of trust in the model, reluctance to be locked into long-term contracts with suppliers, lack of customisation, poor choice and suitability of software applications from ASPs, and few opportunities to integrate disparate applications across technology platforms and business environments. These factors and others led Hagel (2002, p.43) to conclude that

'ASPs in many respects represented a false start in the efforts to break out of the enterprise straitjacket. In particular, few of them adopted Web services architectures as their technology platform. Instead, they attempted to build businesses on the Internet using traditional technology architectures...this proved to be a significant flaw in the early ASP model and explains many difficulties these businesses experienced'.

Type of ASP	Description	Healthcare Examples	Key Challenges
Resellers	Provide new Internet-based distribution channel and 'rental' pricing model for traditional enterprise applications.	Graphnet Health ISoft CSE Health	Gaining customer acceptance, especially new pricing models.
Developers	Develop new applications and deliver on the Internet with 'rental' pricing model.	CSE Health EMIS AVOCA Systems	Large investment in own IT infrastructure, Long lead times, Gaining trust and acceptance in marketplace, Competition with other ISVs
Aggregators	Integrate and market	First DataBank Europe	Potential channel conflicts with

	packages of applications provided by ASP developers	CISCO McKesson Info Solution	ISVs, To many products/services on offer, Competition with other ISVs
Hosting Services	Provide specialised facilities and support services for companies deploying Internet-based applications	IBM Microsoft Sun	Potential over-capacity in an over-crowded market, confusing business model and partners with 'unstable' ASPs
Managed Service Providers	Provide specialised application management	IOKO365 Siemens Healthcare Services SAP	Severe competition in over-crowded market, confusing business model for customers

Table 2. *A Taxonomy of ASPs based on vertical industry positioning (Adopted from Hagel 2002).*

The taxonomy indicates that many different service provider firms operate within the ASP space. More recently, many of these firms have abandoned the 'ASP' acronym and now re-label themselves, Web service vendors. Against a backdrop of failed ASPs, these firms recognise the need to obtain market leadership through strategic differentiation and revenue generation. Whilst many e-business models were premised on the basis that developing a brand preceded profitability (Cassidy 2002), start-up firms, in particular, are unlikely to secure second round venture capital funding without demonstrating a capacity to generate revenues. So from a vendor perspective, entering the market with a poorly thought-through or 'flawed' (Hagel 2002) e-business model will not be sustainable. Equally, from a customer viewpoint, rigorous performance measurement and assessment of benefits and risks is critical, not just in terms of the software application capability, but also in terms of whether the service provider is likely to remain in business. This taxonomy, developed from prior research work (Currie 2003) provides a useful framework for analysing the adoption and diffusion of software applications in a healthcare setting.

3 THE RESEARCH STUDY

The findings reported in this paper are part of a larger, five-year research study that was developed to investigate the deployment, hosting and integration of the ASP and Web Services technologies from both a supply-side and demand-side perspective. The overall research was in two phases. The first phase, comprising of a pilot study, was conducted in the USA and UK (Currie & Seltsikas 2001). An exploratory-descriptive case study methodology (Yin 1994) was used to investigate 28 ASP vendors and 7 customer sites in the UK. The dual focus upon supply-side and demand-side was critical for obtaining a balanced view between vendor aspirations about the value of their business models, and customer experiences, which may suggest a less optimistic picture. The unit of analysis was the business model (Amit & Zott 2001), not the firm or industry level, so a case study methodology was anticipated to provide a rich data set for analyzing firm activities and behavior (Currie et al 2004).

The result from the pilot study led to the funding of two additional research studies by the EPSRC and ESRC respectively. Industrial collaborators were selected for the roles of technology partner, service providers, and potential or existing customers. These studies were concerned with identifying sources of value creation from the ASP business model and Web Services technologies in five key performance areas (namely, delivery and enablement; integration; management and operations; client/vendor relationships; and business transformation).

Research Methodology: The research followed a number of stages involving the use of both qualitative and quantitative data collection techniques and approaches (Walsham 1993). A questionnaire survey and covering note were distributed by e-mail to businesses and healthcare organisations all over the United Kingdom. These organisations were listed on a national database held and maintained by the National Health Service (NHS), the providers of health care to UK residence on a free for all at the point of delivery basis, plus those maintained by the university. To ensure relevant managers and practitioners responded, the covering note clearly stated the purpose of

the questionnaire and requested that it be passed on to the person(s) with responsibility for managing healthcare e-business.

The Questionnaire: Scales to address the research questions were not available from the literature so the questionnaire was developed based on the theory of strategic value (Banker & Kauffman 1988). It included a checklist, open-ended questions and a section seeking organisational data. Research questions under Part 1 required respondents to answer yes/no if Internet technologies application in healthcare was bringing value to patients. Data in part II of the questionnaire was collected by open-ended questions seeking respondents' views on the best approach to healthcare performance improvement and Web Services value creation. Respondents were asked to give their reasons in open-ended questions. A semi-structured questionnaire, rather than open-ended questions, was used to increase the reliability of data since all respondents were asked the same questions, but some added additional supplementary information. The purpose was to impose uniformity across the sample of representation, rather than to replicate the data obtained from each participant (Yin 1994).

The Sample: As a result of the first phase of the research carried out in the USA and UK, a database of 700 international firms was developed, all of which had developed an ASP business model. The data served to build-up a 'data-bank' of market intelligence on a variety of ASP firms and their offerings. Many of these firms were tracked over a four-year period to identify changes in their business models. From this sample of 700 ASPs, about 55% continued in application provisioning (excluding infrastructure) by the time phase two of the research began. A good number of the original sample had ceased to exist (about 24%) and some had been taken over by other firms (about 6%). The remaining (about 15%) had changed their business model, moving away from software-as-a-service (Kakabadse & Kakabadse, 2002) into data storage and managed services provisioning. The ASP database proved to be a very useful source of market intelligence for the research study since it helped to develop a questionnaire survey targeted at the healthcare sector.

Healthcare survey: In phase two of the research, a total of 350 questionnaires were distributed to NHS Information Authority (NHSIA) directors, current and prospective suppliers of IS to the NHS and medical practitioners from general practices in major cities as well as rural town, in an effort to avoid bias. The vendors were drawn from a list of businesses negotiating for contract under a 'primary service providers' scheme (Guah & Currie 2004). After persistent follow-up (telephone calls) exercise, 225 questionnaires were completed and returned, representing a 64% total return rate. As this study was exploratory in nature and was designed to develop a framework to inform practice and guide future research, rather than testing hypotheses (Avison & Fitzgerald 2003) the 225 organisations situations on which it is based provided useful preliminary data.

Respondents were mainly middle level business managers (60%) offering various Internet related services in Web Services to the global healthcare industry, while the rest (40%) consisted of medical practitioners working in the NHS. The 40% included IT coordinator at different institutions nationwide; some already implementing Web Services architecture locally. The vendor organisations were predominantly American and British, consistent with the business structure in the UK. 78% of the companies were large ones with an annual turnover of over £1 billion, while 13% had between £25 Million to £1 billion, and 9% were considered small with an annual turnover of less than £25 Million.

4 KPAS FOR ASP AND WEB SERVICES VALUE CREATION IN HEALTHCARE

The complexity of the regulatory and partnership contract "chains" within healthcare (Institute of Medicine 2002, Wanless 2002), has resulted in extraordinary obscurity in the security, access and control requirements for participating organisations: SchlumbergerSema, EMIS and McKesson are three major German, British and American healthcare enterprises, respectively. They have more than five operating companies each with complicated "contracting chains". Such complexity creates two primary problems in UK health sector:

- Getting and registering the existence of required healthcare business and software processes and data in “real-time”; and
- Allowing only those who need access to software processes and patient data to do so selectively and under knowable and auditable circumstances.

The research operationalised five KPAs (Currie, 2003), which are potential sources of value creation from ASP: delivery and enablement, management and operations, integration, client/vendor alliances/partnerships, and business transformation. This framework, we argue, is also relevant for evaluating Web services. Each category is discussed below in the context of healthcare organisations.

4.1 Delivery and enablement

A commonly used sales pitch on the part of ASPs was to offer 24x7 software applications availability, though customers requirements varied according to the nature of the business use. However, this could not serve healthcare organisations’ need for extensive communication and inter-connectivity arising from adoption of standards and integrated IS (Institute of Medicine, 2002). These organisations have a current need to identify new opportunities in the availability of databases (Ferlie & Shortell 2001, Majeed 2003, Wong 2001) about patient and other medical records. The anticipation is to link inter-organisational, inter-functional, and inter-personal levels of healthcare processes via Web Services, through which they can reshape and improve their core business processes (Gerowitz et al 1996). IT managers interviewed within the NHS were disappointed at the current lack of capacity to access enterprise-wide information from databases. Their major requirement is for IS that provides numerous opportunities to coordinate organisational activities by facilitating communication and information exchange across departments, branches, partners and patients carers without the need to go through horizontal or vertical chains of command.

ASPs resisted this demand, as customization would lead to reduced profits, or even a financial loss. The ability to offer scalability of the software application was another facet of delivery and enablement. Generally, the less complex the application, the easier it was to scale to high numbers. To a large extent, email was the easiest application to offer, as there was no need for customisation. From the data analysis, the largest single issue in terms of delivery and enablement was the fear about data security and integrity. Most ASPs possessed large IT capability in the form of data centres; many pure-play ASPs outsourced this facility (Kern et al, 2002). Yet security of patient data was a serious impediment, as many potential customers in the health sector were reluctant to experiment with an ASP business model, which was immature and poorly supported.

4.2 Management and Operations

One of the perceived benefits of ASP is that healthcare organisations would be able to concentrate on their core competencies (Perseid 2003). ASP vendors argued that the remote delivery of software applications would release managers from the perennial problems of running in-house IT departments. This would allow them more time to develop IT and e-business strategy rather than the day-to-day operations. This justification has been used in traditional forms of outsourcing over many years (Willcocks & Lacity 1998). Our findings suggest that most of the software applications offered by vendors were loosely defined as horizontal, business applications (i.e. accounting, HR, fixed asset management software, etc). Even where healthcare organisations were deploying ASP for more complex applications, there was little evidence that the scale and scope of usage amounted to extra time for managers to engage in other activities. Other benefits to firms were defined in terms of cost savings. Many vendors used TCO models to show how IT costs would be reduced using a remote software delivery model. Our findings pointed to a lack of relevance in TCO models, particularly for the NHS with increasing demands on low IT budgets. One NHS IT manager said, *‘Our overall IT spending is only about £150 k per annum. I don't think using an Web Service solution will necessarily*

save us much money. But if it means fewer headaches with physicians using IT, then I would be prepared to pay more for Web Services! "

Considering Web Services are new technologies that sprung from the ASP business model and are used mostly to automate linkages among applications, they are generally anticipated to make critical systems connections not only possible but also easy and cheap (Kreger 2003, Sleeper & Robins 2002). IT managers believe making connections between NHS organisations and their applications exponentially increases the complexity and cost to their jobs. Indeed business activities, for the NHS, involve communications and transactions with other organisations, such as trading partners, suppliers and patients. Hagel (2002) argues that organisations with better and cheaper connections with one another could gain cost savings in the short term and look forward in the longer term to collaborating more innovatively to give customers more value.

4.3 Integration

Despite poor results from ASP in regard to integrating disparate software applications, Web Services could potentially make a significant difference in integrating software applications across multiple platforms, sites and departments of healthcare organisations. A commonly cited benefit from ASP firms was that software applications across business and IT functions could be integrated to fulfil the goal of enterprise application integration (EAI). Many ASPs planned to develop a wide portfolio of business applications (including ERP, CRM, accounting and financials, logistics, etc). But most of these applications were 'stand alone', provided on a one-to-many model. With Web services, these applications could eventually be integrated to provide the customer with a comprehensive enterprise solution Majeed (2003).

An important question is whether Web Services can be deployed and managed within healthcare; where there is a need for patient data and processes to be integrated, possibly across multiple platforms, environments and sites. To manage such real-time procedure requires the integration of complex enterprise information (see Figure 1).

- Manufacturing: Integrated global pharmaceutical information on drugs manufacturing process.
- Metadata: Information about what is contained in these phases of development.
- Clinical: Clinical trial, side effect, outcomes and in "real-life" effects of drugs.
- Validation: Strategic planning data on the validation of the drug for the target patients.
- Administrative: Healthcare claims, membership, diagnostic and treatment data.
- Financial: Design, development, pricing, deployment and patient intelligence data.

Figure 1 illustrates the data model for the integration of information across the value chain of a healthcare organisation that is multi-vendor and multi-source. Such organisation encourages the definition and sharing of data—within the organisation and among partners and regulators. Two "stacks" of data are articulated in Figure 1 below:

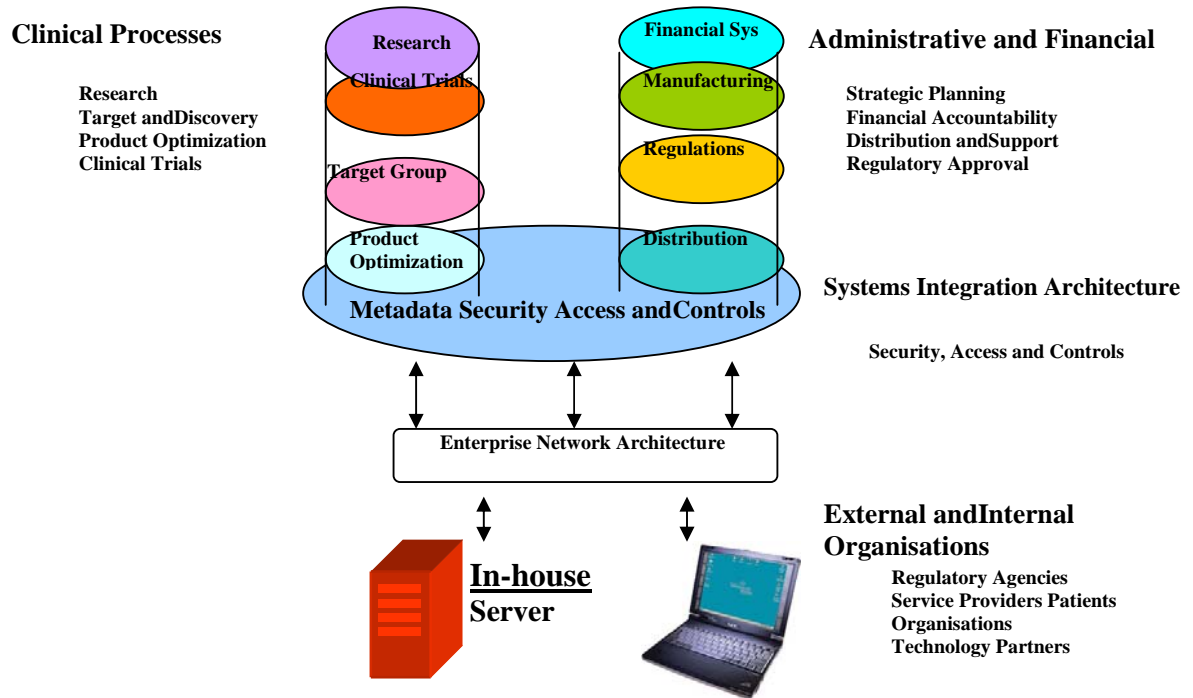


Figure 1. Complex Data generated by Healthcare Enterprises Value Chain (Adopted from Perseid 2003)

Clinical: The data and information supporting medical and R&D of new drug entities.

Administrative and Financial: The data and information supporting the processes of drug approval, production, distribution and patient care monitoring.

Interviews with medical practitioners in the NHS found that integration of software applications was not an immediate priority, or rather, not a priority they were prepared to pay for. So how can ASP and Web Services benefit the NHS? Many organisations, in the NHS, were deploying ASP solutions which were non-mission critical, e.g. email, rather than ERP. One medical consultant, using an electronic diary application commented, “We were not particularly looking for a Web Service solution to organize our time management. However, when a vendor approached us with a product for diary scheduling, we thought to give it a trial. The main advantage of this is that you can make changes to patient appointments from a remote location and submit the data to the surgery. It is particularly useful for staff working away from the surgery for long periods, but the current shortage of GPs in the NHS does not encourage that.”

4.4 Client vendor alliances/partnerships

The ASP business model was premised on the formation of strategic alliances and partnerships with technology and service providers (Currie et al, 2004; Ferergul 2002). Yet many of these partnerships and alliances proved to be unsustainable and insecure. For example, large technology sector firms, such as telecommunications firms, saw opportunities in partnering with independent software vendors (ISVs) to offer hosted software applications on a utility model. The coming together of a utility model of pricing with a new delivery mechanism for software was perceived as a promising opportunity. In addition, hardware manufacturers saw benefits of developing new business by manufacturing ‘thin client’ PCs where data would be stored remotely, i.e. on the server farms owned by the telco. Whilst these arrangements looked like a win-win scenario for all, the reality proved otherwise in most cases. Indeed, the venture between Cable & Wireless a-Services™, Microsoft and Compaq, designed to

offer hosted applications was short lived, lasting under two years. The main reason for this was the immaturity of the ASP model.

Within the context of healthcare organisations, the complexity is likely to increase, particularly as management decisions to procure software are likely to be taken at a much higher level than middle management, for example. Research into two NHS organisations found disappointing results from the ASP business model. Two NHS organisations had to alter their strategies when their service providers went out of business.

Both organisations lost time and money in resolving the problem and are less likely to use an ASP in the future. Whilst predicting the financial stability and viability of ASPs is difficult to do in an unpredictable market, the degree of commitment to a strategic alliance or partnership from a large technology provider or ISV is equally problematic. Our findings suggested that even where large firms (telcos, ISVs, hardware manufacturers, etc) entered into a strategic alliance with ASPs, this was easily unravelled if the business objectives were not achieved within a specific time period. As greater numbers of ASPs failed, ASP adoption rates became fewer. Surviving vendors could not convince potential customers that the ASP business model offered them new benefits for outsourcing their business software applications.

4.5 Business transformation

A more nebulous aspect to ASP is business transformation. With the growth in healthcare ICTs, managers and medical practitioners are faced with a confusing array of software applications from a variety of ASP vendors. The business transformational characteristics of different offerings were not well articulated by ASP vendors, as many were unable to provide practical examples of performance improvement in specific healthcare /technology activities or tasks (Currie et al., 2004). Today, many pundits claim that Web Services would integrate ICT with patient care. They also suggest that using Web Services solutions would help the healthcare organisations keep pace with the latest ICT and give them all the benefits of outsourcing, which had previously accrued only to large firms. For the healthcare organisation, several financial and functional benefits are realized (Guah & Currie 2002):

- The internal and external divisions, partnerships and regulatory agency relationships can be realistically automated for the first time, since access is defined by Web Services.
- Systems integration costs are dramatically reduced and interfaces are standardized, by as much as an order of magnitude.
- Data integration is facilitated as database proliferation ceases.

Our research findings suggest that whilst healthcare organisations were aware of the hypothetical benefits of e-business. However, they were unable to relate these benefits to their day-to-day practical healthcare operations. Many NHS staff simply described the ASP business model as 'a return to service bureaus under a different name', rather than an ICT innovation which would enhance their business processes. The business transformational characteristics of the majority of ASP offerings were also low, as this was dependent upon integration (see Table 1). NHS did not deploy software applications for critical healthcare activities, and many managers were reluctant to do so because of fears of data security.

5 RESULTS FROM THE QUESTIONNAIRE SURVEY

Against the background of the five KPAs (see Currie 2003) as discussed in the previous section, the questionnaire survey was developed to elicit data and information on how potential and existing ASP customers evaluate a range of KPIs in relation to their own business requirements. Using a scale of 0-4 (0 = not applicable; 1 = not important; 2 = quite important; 3 = very important; 4 = critically important), respondents were asked to rank each KPI across the approximately six KPAs. As questionnaire survey instrument is reproduced in Appendix 2. It is outside the scope of the present

paper to discuss all the findings from the questionnaire survey, particularly the sample organisations previous outsourcing experience. All respondents gave their job title, company address and other details about product/service offerings and size of company. For example, the trade fairs attended in the health sector aimed to sell the latest IT products and services to healthcare professionals. Many ASPs therefore targeted specific vertical sectors such as health to enable them to penetrate this market more successfully, as general e-business trade fairs were unlikely to attract healthcare personnel.

Key Performance Indicators	Average Score for all sectors	Average for Healthcare organisations
Delivery and Enablement		
24x7 software applications availability	2.69	2.29
Delivery of end-to-end solution	2.62	2.57
Ability to migrate existing data	2.76	3.14
Data security and integrity	3.33	3.57
Disaster recovery, back-up and restore procedures	3.28	3.57
Plan to access all software applications on-line	2.20	2.57
Integration		
Integration of s/w applications across multiple platforms, sites, and environments	2.37	2.0
Business process re-design through s/w applications integration	2.10	2.0
To create a 'seamless' IT organisation	2.30	2.57
To create an IT infrastructure for better manageability	2.42	2.86
To achieve faster software application implementation	2.41	2.14
Resultant synergy from combination of applications	2.10	1.86
Management and Operations		
To allow management to concentrate on 'core activities'	2.85	3.14
To reduce total cost of ownership (TCO) through s/w applications outsourcing	2.64	2.71
To eliminate the problem of managing IT	2.35	2.57
To pursue e-business strategy	2.0	1.57
External (hosted) applications infrastructure better value for money	2.25	2.14
External (hosted) s/w applications infrastructure more cost effective than traditional outsourcing	2.07	2.0
Greater flexibility of outsourcing as opposed to in-house management of s/w applications	2.06	1.71
Business Transformation		
To keep pace with the latest information and communications technologies (ICT)	2.31	1.57
To integrate ICT with the core business	2.65	3.14
To treat ICT as a service to the core business only	1.96	2.14
Strategic plan to increase ICT outsourcing	1.79	2.14
To gain senior management support for ICT	2.27	3.29
Client/Vendor Relationships		
Desire to develop strategic partnerships with vendors	1.97	1.86
Outsourcing success depends on good service level agreement (SLA)	3.04	3.71
Financial stability of vendor critical to outsourcing decision	2.93	3.43
Single point of contact (with Vendor)	2.71	3.57
Responsiveness of vendor to ICT changes	2.61	3.57
The strength of the strategic partnerships between vendors	2.42	3.0
Mergers/acquisitions/takeovers between vendors	2.14	2.86
Total score in this section	92.89	97.84

Table 4. Scores of Key Performance Indicators sub-divided into Areas

Other variations in priorities emerged. For example, whilst the health sector shared similar concerns with the other sectors (apart from travel) in giving a high priority to data security and integrity, it also identified *allowing managers to concentrate on their 'core' competencies* as an important KPI. This

may reflect the significant changes within the health sector marked by increased paperwork and other forms of bureaucracy. Using an ASP model was therefore perceived as having some advantages in this activity.

The *integration of ICT with the core business* was highlighted by health as important, but less so for the other three sectors. In healthcare, in particular, the lack of integration of ICT has resulted in numerous disparate software applications, although efforts are now in place to devise a national IT strategy for healthcare (Guah & Currie 2002). An interesting finding was that a *strategic plan to increase IT outsourcing* was given relatively low priority in all sectors (apart from health). Whereas the health sector was likely to increase its IT outsourcing as a result of a national IT strategy, the other sectors did not perceive this KPI as a high priority. Within the sectors, finance, IT, and manufacturing, IT outsourcing is now relatively mature, as opposed to travel. Within the area, *business transformation*, only two KPIs: *to integrate IT with the core business* (finance and health) and *to gain senior management support for IT* (health) scored higher than 3. In the case of the latter, it is not surprising that the centralised nature of IT procurement in healthcare precludes IT vendors from gaining access to key personnel (Guah & Currie 2004).

One of the surprising findings from the questionnaire survey in relation to the ASP vendor rhetoric was in the area of integration. Contrary to ASP sales and marketing literature which emphasises the importance of integration (particularly enterprise application integration, no respondents in the sample scored higher than 3 for any KPI within this category. Indeed, the KPI, *strategic plan to increase ICT outsourcing*, was not seen as an important priority by sample firms and *gaining senior management support for ICT* was only considered a priority in healthcare organisations. It is therefore suggested that, without these two KPIs being perceived as highly important, the responsibility for negotiating SLAs is likely to be delegated to more junior management and IT staff, possibly increasing risk. This observation has already been made in the outsourcing literature (Willcocks & Lacity 1998).

Our results, however, pointed to relatively low scoring for these KPIs, suggesting that ASP vendors had possibly misinterpreted the needs of potential customers. Clearly, most of the sales and marketing rhetoric of ASP vendors appeared to echo the messages given to the large customer. Questions therefore arise as to the extent these messages were relevant for healthcare organisations. In particular, that an healthcare organisation would reduce its TCO of IT using an ASP solution despite a low annual IT spend, or that efficiency would be greatly improved with 24 x 7 software availability.

6 DISCUSSION AND CONCLUSION

This paper has provided a snapshot of research results derived from a five-year study on the deployment, hosting and integration of ASP (see Currie, 2003, Currie et al, 2004). It focuses specifically on the UK healthcare sector, which is receiving a major investment in IT over the next five years. Whilst it is not possible to draw definitive conclusions from the results, the variations in the priorities within and across the five KPAs points up some interesting observations. The results discussed in this paper are indicative of the problems, which beset the first wave of the ASP market, most notably, a failure of ASP vendors to provide an attractive value proposition to organisations (Hagel, 2002). Existing literature on healthcare systems have identified four basic types of applications detailed below (Ferlie & Shortell 2001, Haines 2002, Majeed 2003): Group Collaboration; Healthcare Support Systems; Business Intelligence; and eCommerce. The fourth category is a combination of one or more of the other types, but implemented using Internet Technology

Group Collaboration: The original purpose of the Internet was essentially to enable (academic) group collaboration. Proprietary group collaboration applications in the NHS are consequently under great pressure from their low cost, tested and robust Internet equivalents (Laroia 2002, Majeed 2003). *Healthcare Process Systems:* Although the Internet does offer process systems capability, it is unsophisticated and unstable by comparison to the tried and trusted but proprietary Commercial

equivalents. The Internet was never designed to offer more than a very basic transaction capability as is currently required for to support healthcare processes. *Patient Intelligence*: Patient Intelligence usually involves looking for patterns within very large datasets, in the order of millions of individual data items. Viewing reports and simple graphics is easily supported, however complex manipulation of graphical information does not work well using today's Internet technology due to network capacity restraints. *E-Commerce*: At its most basic, eCommerce is buying and selling over the Internet, whether to consumers or business to business. NHS systems may not require a financial transaction system but the need to interact with patients is promoting ecommerce type system to a higher position on NHSIA strategic agenda.

Whilst the ASP market continues to undergo large scale change which is a symptom of competing in a highly volatile and dynamic market place (Eisenhardt & Martin 2000), the main finding from the research study has been the failure of vendors to create value for potential and some existing customers. By delineating KPIs across five KPA as the results from the questionnaire survey point up some interesting findings, which provide a snapshot of how potential and existing customers of ASPs evaluate the ASP or software-as-a-service model. Further research is now underway to provide more detailed vendor and customer scenarios across vertical sectors (i.e. health and finance) and product/services offerings (i.e. ERP) to provide specific examples of how vendors may tailor their offerings to more closely meet the needs of customers. This is particularly important given the current cynicism and myths surrounding the business value of e-business (Howcroft 2001).

Any healthcare organisation tempted to fill the gaps with older technologies should be wary of creating hybrids that will limit its options when Web Services alternatives become available. Proprietary extensions to fill gaps in the features of Web Services, for example, should be implemented as modules with clearly defined interfaces (Kreger 2003). In this way, it will be easier to replace the proprietary extensions with evolving Web Services standards as they become available.

Finally, a staged, pragmatic implementation of Web Services at the edge of enterprises is by no means without pitfalls. This approach gives organisations time to learn about these technologies and to develop insights into the broader operational and strategic possibilities of strategic collaborations. In UK, NHS executives were lulled into complacency by the simple and mundane nature of Web Services. By their early tactical implementations, they have overlooked the broader opportunities and lose valuable time—NHS-Direct is a good example (Wanless 2002). It is management's attitude that will ultimately determine who creates value with Web Services (Gerowitz et al 1996).

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